MIELOO & ALEXANDER

specialised in technology enabled supply chain improvement

tomorrow's vision delivered now

Whitepaper

RFID/EPC™ in Europe

UHF RFID performance: myth or reality?

RFID/EPC™ in Europe

RFID technology is used for tracking and tracing goods throughout supply chains. Since the ever increasing trend towards further globalisation in the world, more and more products are being transported from any part of the world to another. As a result of which tags attached to these products, will be interrogated in various continents.

Balancing UHF RFID frequencies world

Since RFID is based on radio technology it can not be used on a global scale without complying with directives and regulations of many different organizations and institutions.

These directives and regulations in most cases have to do with the use of bandwidth and transmitting power of the RFID system and can therefore have an impact on the performance of the RFID system. This whitepaper gives an insight in the developments of European UHF RFID regulations and the performance of European RFID/EPC™ solutions.

Allocating UHF Bandwidth

Since RFID makes use of radio waves, the technology is subjected to directives and regulations concerning the use of bandwidth and the transmission output power. Therefore every country has its own Radio Communications agency which allocates spectrum and licenses its use. Since the introduction of radio technology, more and more bandwidth has been allocated to all kinds of applications; for example military use, mobile phones, radar, wifi, etc., and each country applies its own use. This makes finding bandwidth that can be used globally pretty difficult.

In order to allocate bandwidth for the use of RFID in Europe, the European Commission issued a mandate under Council Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations. In response to this mandate the ETSI (European Telecommunications Standards Institute) produced a set of technical requirements under: EN 302 208-1 Electromagnetic compatibility and Radio spectrum matters (ERM); Radio frequency identification equipment operating in the band 865 MHz to 868 MHz with power levels up to 2W.

ETSI is one of three official recognized European Standards Organisations (ESO) and has an important role in supporting the European Commission and the Secretariat of the European Free Trade Association concerning regulatory and legislative matters related to telecommunications. ETSI's main role is to provide technical specifications (or standards) that may be called up in the various European Directives and Regulations.

Within the UHF frequency range several countries have their own specific bandwidth allocated to RFID (for the frequencies in use in major areas, see Figure 1).

Many Middle Eastern, African and South American countries are still in the phase of allocating bandwidth for UHF RFID Technology.

In order to be able to track and trace the RFID tags globally the Generation 2 protocol, developed by EPC Global, demands that the tags, as long as the frequencies are within the designated UHF range (860 - 960 MHz), can be read all over the world. Most tag producers deal with this demand by optimizing the tag-antenna to a frequency somewhere in the middle of the UHF bandwidth (around 910 MHz). Other manufacturers design tag-antennas which can be used over the full spectrum, but are optimized for use in the US or Europe specifically. Note that these tags will work globally, but with reduced performance.

Country	Frequency range (MHz)	Power level	Technique	Comments
China	040.5-044.5, 920.5-924.5	2W erp	FHSS	
Europe	865.6-867.6	2W erp	LBT	
India	865-867	4W erp	FHSS	
Japan	952-954, 952-955	4W eirp	LBT	License required for using 952-954 MHz at 4W eirp, 952-955 MHz available for unlicensed use at 20 mW eirp
USA	902-928	4W eirp	FHSS	

Figure 1: Major Worldwide UHF RFID Frequencies

R&TTE & CE

Use of national radio spectrum in Europe is governed by national authorities. Most national authorities in Europe state that compliance with the R&TTE-directive (Radio and Telecommunications Terminal Equipment) is mandatory for the unlicensed use of UHF RFID equipment in their country.

Radio and Telecommunications Terminal Equipment (R&TTE) is equipment and its relevant components that are capable of communication by the emission and / or reception of radio waves (i.e. radio equipment) and / or enabling communication by connecting to the interface of public telecommunications networks (i.e. telecommunications terminal equipment). Some equipment, e.g. a cellular mobile telephone is both radio equipment and telecommunications terminal equipment.

Figure 2: Symbol and Sirit UHF RFID readers

The R&TTE Directive is part of the "New Approach" series of European Directives that simplifies the procedures for placing on the market, free circulation and putting into service of R&TTE. Manufacturers must ensure that equipment is designed to meet the essential and administrative requirements of the R&TTE Directive and keep technical records to demonstrate this. A declaration of conformity must also be produced. Manufacturers must be able to demonstrate compliance with the essential requirements of the Directive, either by applying a European harmonised standard or consulting a notified body . The use of a harmonised standard is not compulsory.

The essential requirements cover the health and safety of the user and others, electromagnetic compatibility and effective use of the radio spectrum. One of the ways this is realised is the required CE-marking on RFID equipment. Additional essential requirements may apply to certain types of equipment. Harmonised standards specify how the essential requirements can be met.

CE-mark

The main body mandated to produce telecommunications technical standards in relation to the R&TTE Directive is the European Technical Standards Institute (ETSI).

Interface requirements for radio equipment provide a link between the requirements of the R&TTE Directive and the use of national radio spectrum.

European Frequency in More Detail

The ETSI EN 302 208 regulation not only prescribes bandwidth and output power, it also prescribes the division of the bandwidth in channels, the communication technique for the reader, maximum time per transmission and the reader-antenna beam width.

European Bandwidth

The European UHF RFID band stretches from 865.0 to 868.0 MHz and is divided into 15 channels with a width of 200 kHz. The maximum output power is 2 W ERP, but not for all 15 channels. Figure 3 gives an overview of all the 15 channels and their maximum output power.

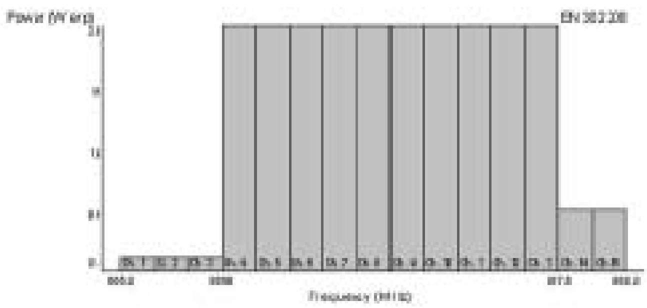


Figure 3: European RFID bandwidth

Most of the reader manufacturers use only the 10 channels which may go up to 2 W ERP of output power (stretching from 865.6 tot 867.6 MHz). Since the amount of output power is in direct relation to the reading distance of a tag, this is a wise decision. In most applications the tag will be read from several meters distance, in using also the first three and last two channels, the chances of tags being missed are high.

The prescribed output power of the reader is given in Watt ERP. ERP stands for Effective Radiated Power and is the power radiated by the antenna of the reader in its direction of maximum gain under specified conditions of measurement and in the absence of modulation. ERP is usually calculated by multiplying the measured transmitter output power by the specified antenna system gain, relative to a half-wave dipole, in its direction of maximum gain.

Communication Technique for the Reader

As stated above, the RFID readers in Europe use 10 channels for transmitting from reader to tag and receiving tag data back. In order to solve reader-to-reader collisions, the ETSI regulations prescribe that a frequency agile technique must be used. This technique is used to determine an unoccupied channel in order to minimize interference with other users on that same channel. ETSI prescribes as the agile technique the so-called Listen-Before-Talk technique.

Listen-Before-Talk (LBT) is also known as listen-before-transmit and is a technique to find an unoccupied channel prior to transmitting.
Where the receiver of a reader detects that a channel is already occupied by another device (not only other RFID readers, but all other radio transmitters on this specific channel), the reader will automatically switch to another channel and check if it is unused before transmitting its carrier.
In situations where the receiver of a reader detects that all of the channels in the permitted band are occupied by other devices the reader shall remain in the idle mode. The reader shall not transmit its carrier until its receiver has detected a channel that is unused.

LBT Thresholds	□Up to 100mW□	□	83dBm
□	□	101mw to 500mW□	90dBm
□	□	501mW to 2000mW□	93dBm

Sequence of Transmitting and Receiving

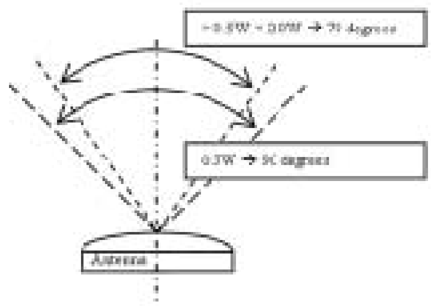
ETSI regulations further break down the Listen-Before-Talk technique by prescribing the communication sequence and maximum communication time. Before each new transmission the reader mandatory needs to listen for 5 milliseconds to hear if the selected channel is unused to start transmitting. If the channel is free, the reader is allowed to communicate on that specific channel for no longer than 4 seconds. After these 4 seconds the reader can immediately switch to another channel where it has to listen for 5 milliseconds again or if another communication is planned on the first channel an idle period of 100 milliseconds is mandatory.

Beam width of an RFID reader-antenna

According to ETSI regulations, the beam width (aperture; the diameter of the cross-section of an antenna's radiation pattern in the direction of highest gain) of the dedicated reader-antenna in both horizontal and vertical orientations shall comply with the following limits:

- For transmissions = 0.5 W, beam widths shall be = □ 90 degrees

- For transmissions between 0.5 W and 2.0 W, □ □ beam widths shall be = 70 degrees



Differences in RFID regulations for Europe and the US

Looking at the ETSI regulations and comparing them to FCC Part 15 regulations for UHF RFID use in the US, makes clear where the differences in performance between RFID systems in these two continents come from.

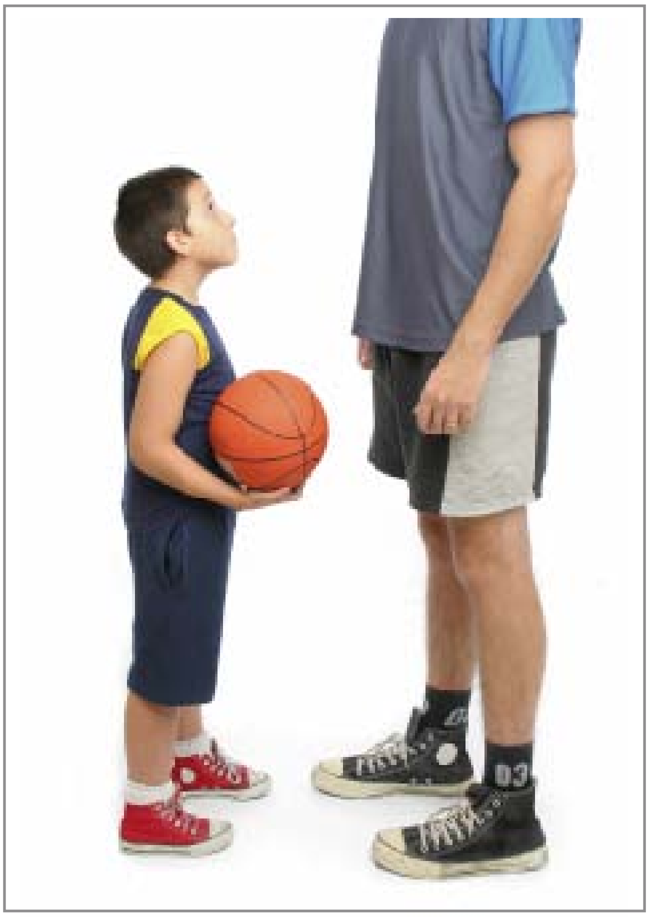
Figure 4 below shows the most important differences between RFID regulations in these two continents. These differences will be discussed and the impact on performance will be made clear.

Feature	Europe	US
Regulation	EN 302 208	FCC part 15
Band	865.5 - 867.5 MHz	902.0 - 928.0 MHz
Bandwidth	2 MHz	26 MHz
Number of channels to be used	10	50
Bandwidth of one channel	200 kHz	500 kHz
Listen Before Talk (LBT)	Y	N
Frequency Hopping Spread Spectrum (FHSS)	N	Y
Reader output power	2 W ERP	4 W ERP

Figure 4: Differences between European and US regulations for UHF RFIDUSulations for UHF RFID

Difference in Bandwidth

In the US a much bigger part of the radio spectrum is preserved for use of RFID equipment (26 MHz compared to 2 MHz for Europe). This broader radio spectrum can then be divided into more channels (sub-bands) each with a bigger width than European channels.



Size matters in bandwidth

Difference in Number of Channels

In having much more radio spectrum reserved for UHF RFID in the US, this bigger bandwidth can be divided into 50 channels compared to only 10 channels in Europe. As stated above in dense reader environments where many readers are operating at the same time the chance of having reader-to-reader collision in Europe is 5 times higher than the chance of having these collisions in the US.

Difference in Bandwidth for Each Channel

Also in having much more radio spectrum reserved for RFID in the US makes it possible to have broader channels than European channels. US channels are 500 kHz wide where European channels are only 200 kHz wide. As comparison think of having a connection to the internet with a telephone-modem compared to using an ADSL connection; the more bandwidth makes the connection much faster, thus increases data rates.

Listen-Before-Talk compared to Frequency Hopping Spread Spectrum

With Listen-Before-Talk the reader has to listen before each transmission for 5 milliseconds and thus loses tag interrogating time.

Frequency Hopping Spread Spectrum (FHSS) is a transmission technology where readers bounce from channel to channel in a pre- assigned, pseudo-random sequence to avoid bumping into each other. As stated above, in having more channels in the US the chance of reader-to-reader collisions during the frequency hopping is much smaller.

The sequence of transmitting and receiving for a US operating RFID reader is different than for a European RFID reader; under LBT a reader must listen 5 milliseconds before each transmission of maximum 4 seconds where in the US the reader is allowed to transmit for a maximum of 0.4 seconds before it has to 'hop' to another channel.

A comparison can be made between these regulations:

- Assuming no reader-to-reader collisions are encountered, a US reader can make a full hop over its 50 channels within 20 seconds (50 channels multiplied by 0.4 seconds). Assuming within 20 seconds the US reader interrogates 50 tags each on another channel for exactly 0.4 seconds per tag-interrogation.

- Assume a European reader will also interrogate tags for 20 seconds with an interrogation-time per tag for 0.4 seconds and hopping to another channel after each interrogation; this means first listen for 0.005 seconds if there is no other radio device operating on this frequency and then start interrogating a tag for 0.4 seconds. Again assuming no reader-to-reader collisions are encountered this will lead to 49 tag interrogations (20 seconds divided by 0.405 seconds/interrogation). In this example it means that the European reader interrogates 1 tag less than the US reader. It also means that the European reader has a non-interrogating period of 0.25 seconds (49 tag-interrogations multiplied by 0.005 seconds listen-before-talk time per interrogation).

- If we use the numbers from the calculations above we can see that the US reader has a duty cycle of 100% (20 seconds of interrogating during the 20 second period) where the European reader has a duty cycle of 98.75% (20 seconds minus 0.25 non-interrogating seconds divided by 20 seconds). Duty cycle is defined as the proportion of time during which a component, device, or system is operating. The duty cycle is expressed in percentage.

- Taken into account that the chances of European readers having reader-to-reader collisions in dense reader environments are much higher than for US readers (5 times), this duty cycle will only decrease even more because if the European reader detects a channel is in use by another device it has to listen again for 5 milliseconds on another channel before it can start interrogating the tag; and thus for one tag-interrogation the reader has listened for 10 milliseconds instead of 5. This number will increase rapidly when the number of radio devices increases in the reader's environment, leading eventually to the reader being fully out of operation (only listening instead of interrogating).

According to ETSI regulations, a European reader is allowed to use a channel for a maximum duration of 4 seconds, within these 4 seconds the reader has to listen only once (LBT of 0.005 seconds) before using this specific channel. In order to have the biggest possible duty cycle, the reader has to use each channel for exactly 4 seconds and then has to switch directly to another channel. Assumed there are no reader-to-reader collisions, the same sequence can start all over again. This method gives the biggest possible duty cycle which equals 99.88% (4 seconds divided by 4.005 seconds). As stated above, the lowest possible duty cycle is 0% (when reader-to-reader collisions occur full time).

Difference in Reader Output Power

The allowed reader output power for European and US readers is different. For Europe the ETSI regulations allow up to 2 W ERP where the FCC regulations in the US allows for 4 W EIRP. Since the units are different in the two regulations the definitions for ERP and EIRP will be given.

Effective Radiated Power (ERP) is the power radiated by the antenna of the reader in its direction of maximum gain under specified conditions of measurement and in the absence of modulation. ERP is usually calculated by multiplying the measured transmitter output power by the specified antenna system gain, relative to a half-wave dipole antenna, in its direction of maximum gain.

Effective Isotropically Radiated Power (EIRP) is the amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions) to produce the peak power density observed in the direction of maximum antenna gain. EIRP takes into account the losses in transmission line and connectors and the gain of the antenna.

There is a relation between Effective Radiated Power (ERP) and Effective Isotropically Radiated Power (EIRP). Because a half-wave dipole antenna is used as a reference for ERP compared to an isotropic antenna for EIRP, they differ by a constant factor of 1.64; meaning 1 W ERP equals 1.64 W EIRP.

The FCC eases EIRP limitations for fixed, point-to-point systems that use higher gain directive antennas. If the antenna gain is at least 6 dBi, the FCC allows operation up to 4 watts EIRP. The gain of an antenna represents how well it increases effective signal power in a particular direction, with dBi (decibels relative to an isotropic radiator) as the unit of measure. The higher gain antennas have greater directivity, which propagate RF energy more in one direction than others. This reduces the possibility of causing RF interference with other nearby systems.

ETSI regulations allow for readers to transmit at 2 W ERP, which equals 3.28 W EIRP. FCC regulations allow for readers to transmit at 4 W EIRP, which equals 2.44 W ERP. This means that US readers may transmit at higher power output levels than European readers (1.22 times higher (2.44 divided by 2)). If one takes the following simplified formula for calculating RF field strength (a quantitative expression of the intensity of an electric field at a particular location):

$$S = \frac{P_r}{A_{sphere}}, \text{ where } A_{sphere} = \pi \cdot r^2$$

In this formula S is the RF field strength, Pr is the reader output power (in W ERP) of the transmitter and A is the surface of the cross-section of the read-field at a distance R from the transmitter source. In this particular case A has the shape of a sphere with a radius of r (see Figure 5).

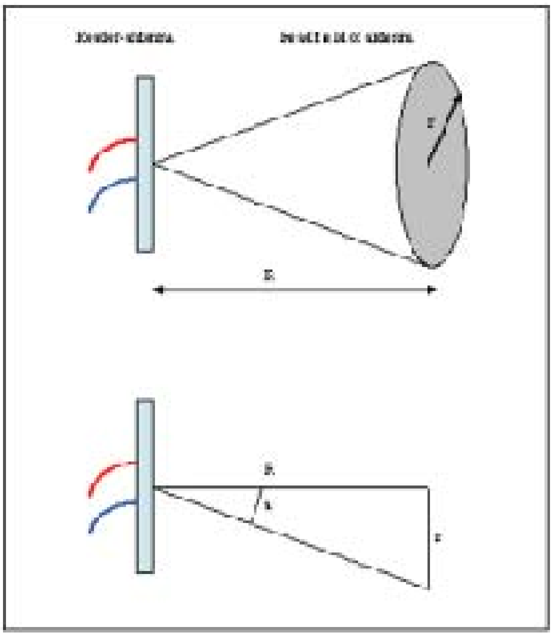


Figure 5: Read field around an antenna

As stated before, for European readers $\alpha = 35$ degrees (aperture must be = 70 degrees for readers emitting with 2 W ERP).

If the formula as presented above is rewritten one gets the following formula:

$$S = \frac{P_r}{\pi \cdot r^2}, \text{ where } r = R \cdot TAN(\alpha) \text{ and thus: } S = \frac{P_r}{\pi \cdot (R \cdot TAN(\alpha))^2}$$

If one compares a European reader to a US reader with the same reader-antenna setup with R and a as constants, the formula can be reduced to:

$$S = c \cdot P_r, \text{ where c is a constant}$$

This shows that there is a direct relation between the RF field strength and the reader output power. Since US readers are allowed to transmit at higher output power (1.22 times European readers); their field strength is also higher (also a factor of 1.22). In knowing that increasing the field strength in the read zone makes the tags respond better (tag will be energized more easily), the chances of a tag responding in a US read field is bigger than a tag in a European read field.

Since tags will be placed on all kind of products and thus on all kind of (packaging) materials, both absorption of RF signals and reflection of RF signals will occur during reader-tag interrogation. The dielectric constant is the measure of a material's ability to store a charge when an electric field is applied, or its 'capacitance'. If a material has a high dielectric constant, it reflects more RF energy and detunes the antenna more, which makes it harder to tag. Examples of materials with a low dielectric constant are dry paper (2), plastics (most are between 2 and 4), and glass (between 5 and 10). Water's dielectric constant changes: At room temperature it is 80; near boiling it is 55; and when frozen it is 3. One solution to work around this de-tuning effect is to design a tag-antenna shape for each specific material, but also an increase in field strength of the read field will help in getting the de-tuned tag energized; again the US reader, with its bigger field strength, has an advantage over the European readers.

Conclusions of Differences

From the above differences, some conclusions can be drawn:

- The chances of reader-to-reader collisions in a dense reader environment are 5 times bigger in Europe than in the US.
- European channels are much smaller than US channels, therefore leading to lower data rates for European readers.
- European readers have a maximum duty cycle of 99.88% (best case), compared to 100% for US readers. This leaves less tag-interrogation time for European readers compared to US readers.
- US readers have higher field strengths than European readers, making the chances of tags being energized bigger.

From these conclusions it is clear that European RFID systems will have lower performance than US RFID systems. This makes good system design even more important for European RFID systems than it is for US RFID systems. For example, since dense reader environments are even more problematic to European systems, making the readers work only if tags are presented to the reader makes sure no unnecessary RF noise is polluting the few European channels. One way of doing this is by using light sensors that will turn on the reader once tags arrive in the read field. More and more UHF RFID solutions require the use of sensor technology (photocells, motion sensors etc.), making it increasingly important to be able to manage such devices with RFID network infrastructure technology such as the Reva TAP produced by Reva Systems.

Developments in Europe

Developments of RFID technology in the past year has been focused on the handling of a ”dense-reader-environment”, a situation with multiple readers operating close to each other. Due to the restricted bandwidth available for UHF RFID in Europe, problems with interference between RFID readers are a much bigger problem than in the US. In Europe, when using LBT as the technique for frequency use, readability problems start when 5 or more readers are operating in the same general area.

Recent developments are the imminent removal of the LBT requirement and the discussions on a 4-channel mode to allow multiple readers to operate in the same area.

Dense reader mode & LBT

Dense reader mode is a mode of operation that prevents readers from interfering with one another when many are used in close proximity to one another. Readers hop between channels within a certain frequency spectrum and under LBT are required to listen for a signal before using a channel. If they 'hear"another reader using that same channel, they go to another channel to avoid interfering with the reader on the former channel.
Source: www.rfidjournal.com/faq/19/78

The reason why readers may not operate on the same channel is because after the reader has transmitted, the tag will respond on the same channel. If another reader is also operating on this channel, this second reader will drown out the tag signal, since the reader ‘shouts’ and the tag ‘whispers’. This ‘one reader – one channel’ property of current LBT regulations means that readers cannot share the same channel at the same time causing a drop in the cycle time of a reader.

In the 4-channel Dense Reader Mode (DRM) currently being developed by the ETSI, the idea is to split the transmitting of readers and the receiving from tags in the frequency domain. Readers will collide with other readers but not with tags. Readers will filter interfering readers from their tag responses. By doing this, readers will transmit only in the channels 4, 7, 10 and 13, and receive tag signals on channels 1, 2, 3, 5, 6, 8, 9, 11, 12, 14 and 15. The reader transmits over the full bandwidth of one channel (200 kHz) and uses Miller modulation when transmitting which makes the tag respond in the adjacent channels (e.g. a reader transmitting in channel 4 makes the tag respond in either channel 3 or 5). Typically, a tag’s response is much weaker than the reader’s transmission.

In operating in this way, RFID can work without interfering with other radio equipment and readability performance will increase.

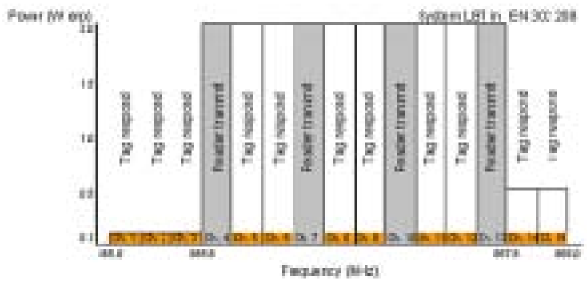


Figure 6: DRM for 3 adjacent dock doors

Figure 6 shows a typical situation of DRM: 3 adjacent dock doors with each 2 antennas and a reader. In order to reduce the interference between these readers, the antennas used by various dock doors need to be synchronized or controlled. In the picture as shown the antennas operating on the same channel are connected by one reader. This allows the reader to synchronize the channels and thus antennas A and B can operate at the same time. A second advantage by synchronizing antennas on the same channel by one reader is that the reader itself does not have to switch between different channels during operation. Reader adjustment from one channel to another takes time and thus decreases the cycle time of the reader.

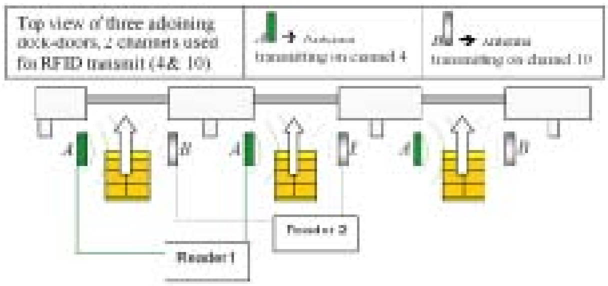


Figure 7: DRM for 3 adjacent dock doors

There is a European initiative, ETSI task group 34 (TG34), working on a 4-channel mode "system LBT". This initiative plans a step further in the synchronisation: synchronizing the readers by one central entity. This will allow for improved control of both readers and frequency use. In tests in Germany at Metro, it was possible to use such a system successfully with 36 dock doors next to each other being used simultaneously, while complying to requirements stated in EN 302 208 (LBT). Work is currently underway to include a DRM 4-channel mode with central synchronization between readers in the ETSI standards.

European Mandates

In contrast to the US, in Europe not many companies/ governments/ institutions mandate their suppliers to tag their products before shipping them to the customer. The only known 'mandate' is the one from the Metro Group. However the Metro Group have stressed, that they haven't issued mandates but have appealed to their suppliers to further collaborate with them. Other major retailers like Tesco, the largest retailer in the UK, are working closely with suppliers to solve the technical problems without mandates. Carrefour in France is involved with RFID pallet and case tagging on a major scale. The pharmaceutical companies are extensively trailing RFID for item level tagging.

Metro Group Mandate

Approximately 30 suppliers of the Metro Group have been tagging pallets with Gen 1 tags for Metro, the world's third largest retailer and a major proponent of RFID. Metro had originally expected to deploy Gen 2 equipment before the end of 2005 as part of the second phase of a rollout begun November 2005. Delays in the ratification of the Gen 2 standard, however, combined with the special RFID requirements of the European market, have slowed down its plans.

By the end of the year 2006, Metro said, it will have 100 companies enrolled in its RFID tagging program, which requires suppliers to tag shipping pallets for delivery to distribution centres and stores. The program also calls for them to send electronic advance shipping notices related to those shipments.
www.rfidjournal.com/article/articleview/1916/1/1

As per May 25th 2007, Metro has told its top suppliers they will need to put RFID tags on all pallets shipped to 180 Metro locations within Germany starting Oct. 1st 2007. If current testing of RFID's ability to track cases in the supply chain proves successful, the company might also require suppliers to begin tagging cases, sometime in 2008.
www.rfidjournal.com/article/articleview/3341/1/1

European RFID Use Cases

Marks & Spencer

After assessing the results of a trial, in November 2004, using RFID tags to track items of clothing at its High Wycombe store near London, U.K. food and clothing retailer Marks & Spencer (M&S) says it plans to extend its trial of item-level tagging.

In the initial trial, which was partially funded by the U.K.'s Department of Trade and Industry as part of the New Wave Technology program, M&S tagged 10,000 items of men's suits, shirts and ties between October and November 2004 and sold 7,000 of the tagged items during that period. Items were tagged with what M&S calls "intelligent labels." Operating at 868 MHz, the five-inch-long paper labels were developed by Paxar, a White Plains, N.Y., a retailing technology company, and Dewhirst, a major supplier of clothing to Marks & Spencer, with microchips from Swiss company EM Microelectronic.

The company chose to tag three types of menswear because they represented three different ways that clothing items are delivered from the company's distribution centres to its stores. The suits are shipped on hangers, the shirts are shipped flat in reusable totes, and the ties arrive at the distribution centres in boxes and are then transferred to hangers before shipment to stores.

According to M&S, item-level tagging of its clothing offers the benefits of knowing exactly what stock is in each of its stores. The retailer wants to use RFID to help further in its goal of 100 percent stock accuracy that will enable it to ensure the right goods are delivered to the right store at the right time.

As well as tracking shipments to the store, RFID was used to provide an accurate reading of the items remaining in the store at the end of the day. This information was then sent to M&S' central inventory database to help ensure the right items were delivered the next day. Prior to the trial, the only way this data had been collected was using point-of-sale terminals equipped with bar code scanners. The results of the trial showed that there were significant differences in the true inventory levels, as determined by the RFID system, the estimated inventory levels that were deduced from using information collected by the point-of-sales terminals, which remained in place during the trial.
www.rfidjournal.com/article/articleview/791/1/20

Mieloo & Alexander implement video tracking RFID system at Sony Logistics Europe: Use of RFID leads to structural efficiency improvements and increases supply chain reliability

Sony Supply Chain Solutions (Europe) are currently using a combination of UHF RFID technology with closed-circuit video surveillance to improve the efficiency, throughput and reduce shrinkage at the largest European Distribution Centre (EDC) in Tilburg – The Netherlands. All consumer electronics for the German market are tagged at item level at the EDC in The Netherlands. During the order picking process, products such as DVD players or camcorders are provided with an RFID tag that is embedded in the barcode label. After sorting, the customer orders are put on pallets which are also labelled with an RFID tag. Subsequently the pallets are driven through a specially developed RFID performance enhancement tunnel, which considerably increases the RFID read performance; 160-200 items per pallet are identified effortlessly. This information is interfaced with the SAP Warehouse Management system.

After identifying all products on a pallet, the pallets are moved to a wrapping station. At this position all items are identified once more by the RFID solution and also recorded on the video surveillance system. Then the RFID tag numbers (EPC codes) of the boxes and pallets are projected on video. This (video) data is stored and managed with advanced video tracking software.
Finally the pallets with products are shipped and loaded onto the trucks, where the process is repeated: the tags are scanned again and recorded on video.

The combination of item-level tracking and the video images reduces theft and loss, and assists Sony in reconciling shipment information with its customers. If an item is lost in-transit, Sony has a visual record (indexed by Standard Serialized Container Code: SSCC) of the condition of the goods when leaving the EDC.

The integrated RFID and video solution provides Sony with an optimally organized goods flow and watertight and efficient proof of delivery. If a customer calls with a question about a delivery, the claim handlers can verify the content of the shipment by checking the tape. If so desired, Sony can send the video file in question to the customer through a link or on a CD.

The integrated RFID and video solution provides Sony with: productivity improvements and labour savings, reduced throughput times, reduced claims and improved customer satisfaction. The expected return on invest (ROI) is less than a year.

Figure 8: Sony Supply Chain Solutions (Europe)'s Tilburg Logistics Centre

Sony Supply Chain Solutions (Europe) (SSCS (E)) in Tilburg is Sony's primary European distribution centre. SSCS (E) distributes products directly to Sony dealers in a large number of European countries, and supplies the majority of the local warehouses in Europe for the company's Consumer Electronics, Professional products and Recording Energy & Media divisions. The annual throughput of this location is some 600,000 M3, for 1.2 million customer orders, and there are some 30,000 truck movements per year.

About Mieloo & Alexander

Mieloo & Alexander Business Integrators is a consulting firm that specializes in technology enabled supply chain improvement, with a focus on supply chain management and visibility through the use of innovative information technology (RFID). The highly trained consultants design, plan and implement advanced supply chain solutions that focus on RFID Electronic Product Code (EPC) and real-time locating solutions (RTLS). Mieloo & Alexander has customers throughout Western Europe that include multinationals such as Sony, Akzo Nobel, KPN, ASML, TNT and Hitachi. Mieloo & Alexander is headquartered in Hoofddorp in the Netherlands.

Our office

De Zuidtoren
Taurusavenue 13
2132 LS Hoofddorp
The Netherlands

T: + 31 (0) 23 565 6000
F: +31 (0) 23 565 6009

For more information see:
www.mielooandalexander.com

Office Mieloo & Alexander

Mieloo & Alexander

Mieloo & Alexander Business Integrators is a consulting firm that specializes in technology enabled supply chain improvement, with a focus on supply chain management and visibility through the use of innovative information technology (RFID).

Contact details:

De Zuidtoren
Taurusavenue 13
2132 LS Hoofddorp
The Netherlands

T: + 31 (0) 23 565 6000
F: + 31 (0) 23 565 6009

For more information visit our website:
www.mielooandalexander.com